



The Degritting Clarigester



The Clarigester

small plant sewage treatment...



The Duo-Clarigester



The Compleator

with BIG PLANT results
and small plant operation...

*Clarification and sludge digestion
in a single tank ...
regardless of how small the sewage flow*

DORR-OLIVER

STAMFORD, CONNECTICUT - U.S.A.

SOLE AGENTS

DEGRITTING CLARIGESTER

CLARIGESTER

Dorr-Oliver equipment for small plant sewage

DUO-CLARIGESTER

COMPLETREATOR

INTRODUCTION

Prior to 1929 it was believed that the cost of a fully mechanized sewage treatment plant was beyond the reach of the small community. This was true to a certain extent, because big plant units, when scaled down in size, were not directly applicable to small plant requirements.

The small plant picture was completely changed by the introduction of the Dorr Clarigester, a combination unit in which mechanical clarification and mechanical sludge

digestion are accomplished in a single, two-story tank. This revolutionary equipment made its first appearance in 1929 at a small municipal installation at East Rochester, New York.

Today, the small plant picture continues to improve as a result of the development of the Dorr-Oliver Degritting Clarigester, providing positive, **mechanical** grit removal in the same tank with a conventional Clarifier. This new "Degritting" device is available on all sizes of **existing** Dorr Clarifiers Type A, and Clarigesters between 20' and 40' diameter. In either case, it will remove troublesome grit from the raw sewage without the need for costly separate grit handling facilities.

Further modification to the basic Clarigester design includes the Dorr Duo-Clarigester providing primary and secondary sedimentation, as well as sludge digestion, in a single tank, and the Dorr-Oliver CompleTreator which provides complete sewage treatment in a single tank.

This bulletin covers in detail the Degritting Clarigester, Clarigester and also includes brief descriptions of the CompleTreator and Duo-Clarigester. The unit which is most economical will depend on such local conditions as population, available space, degree of treatment required, etc.

GRIT REMOVAL IN SMALL PLANTS

Before the introduction by Dorr-Oliver in 1956 of the new mechanical "Degritting" device for the Clarigester and Clarifier, it was necessary for small sewage plants to maintain a separate grit chamber which had to be manually cleaned at all too frequent periods.

This 14' dia. Dorr Clarigester shown in foreground is a vital part of the sewage treatment plant at Bowie State Teachers College, Bowie, Maryland. The plant is another project undertaken by the State of Maryland Dept. of Public Improvements for eliminating pollution on a state-wide basis. Despite the modest size of the plant, a high degree of treatment was required because of the low flow in the stream receiving the effluent. Complete treatment

is provided for a population of 500 with an average flow of 50,000 GPD by means of a low-rate trickling filter flowsheet followed by sand Filters. Because a full-time operator would not be available, it was essential that the mechanical equipment require minimum operating attention and maintenance. Other Dorr-Oliver equipment shown includes a 40' dia. Distributor (right) and a 14' dia. Secondary Clarifier, in back of the Clarigester.

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treatment . . .



When grit chambers are cleaned by hand they must be cut out of service and the supernatant is pumped or drained off. The grit is then shoveled into buckets, or other receptacles, and removed. With manually cleaned chambers, in addition to the inconvenience, there is also the added expense of maintaining an extra unit so that one will be in service while the other is being cleaned.

The importance of adequate grit removal and handling facilities is well recognized in the modern sewage treatment practice. Grit in the sewage treatment field is generally considered as that sand, gravel, cinders and other inorganic material, 65 mesh and larger, having a specific gravity of 2.65. It also may contain coffee grounds, seeds, and other non-putrescible organic material. The removal of grit in advance of other treatment processes facilitates the handling of the sludge produced and prevents unnecessarily rapid wear of machinery.

If grit is permitted to settle in Imhoff or sedimentation tanks, it is apt to remain in the bottom of the tanks or in

pipe lines through which the sludge flows and becomes extremely difficult to remove. In some instances grit in a settled condition has been known to compact and solidly plug a sludge line.

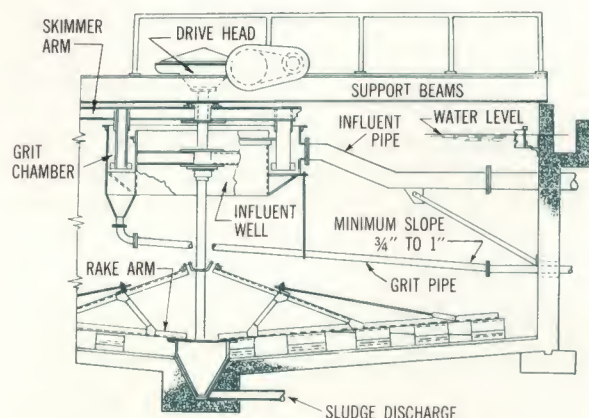
The efficiency of grit facilities is measured not only by the percent removal of grit from the total flow, but also inversely by the amount of putrescible organic material removed with the grit. The fundamental concepts of contemporary grit chamber design are based on the premise that: "A sand grain suspended in a liquid tends to settle at the same velocity with reference to the surrounding fluid regardless of whether the body of liquid is at rest or moving in a horizontal direction."

From this statement the concept of surface area as the critical factor in grit chamber design has been developed. The Dorr Detritor was designed on these principles almost 30 years ago, and today is the most widely used method for grit removal in medium and large scale treatment plants.



The Degritting Clarigester

The Degritting Clarigester is Dorr-Oliver's revolutionary answer to the age-old small plant sewage treatment problem of what to do about grit; how to remove it effec-



Sketch of the Dorr-Oliver Degritting Clarigester showing the unique feature of this new unit, the "grit chamber," providing positive mechanical grit removal with conventional clarification in a single tank.



tively, efficiently and economically? The answer: Positive **mechanical** grit removal with conventional clarification in a **single** tank.

Essentially, the Degritting Clarigester mechanism consists of a worm gear drive head mounted on traverse beams and supporting a vertical shaft to which are attached the skimming arm and the Clarifier and Digester mechanisms. The slowly rotating mechanism is driven by an electric motor through a gear reduction unit and chain drive to the worm countershaft.

The "Degritting" feature of the Clarigester is based on the same design principle incorporated in the Dorr Detritor. Briefly stated, this is that the determining factor in grit chamber design is area. Sufficient area is provided for all plus 65 mesh grit with specific gravity of 2.65 to settle out. The unique feature of this new unit is that the "grit chamber" is an integral part of the primary Clarifier. The chamber itself is an annular channel surrounding the influent well.

specifications

GENERAL DESCRIPTION The contractor shall furnish and erect in place Degritting Clarigester equipment, including scum raking mechanism, slum skimmer and degritting mechanism for the Clarifier compartment, scum breaking arms and sludge raking mechanism for the Digester compartment, driving mechanism and central shaft, motor and speed reducer, overhead alarm and motor control, influent well with degritting chamber, 154 inch gas dome, automatic overhead control, structural support beams, and various required supplemental clarifying pump.

Equipment shall be designed to fit the existing concrete tank diameter and total side water depth as shown on the plans and as specified and shall be type PB as manufactured by Dorr-Oliver Inc., Stamford, Conn. Included shall be the services of an engineer to inspect the equipment installation and to supervise the initial operation.

CLARIFIER AND DIGESTER MECHANISMS The Clarifier sludge raking mechanism shall consist of two shafts, one steel and one cast iron, with raking blades and syringes attached at intervals and arranged to move the sludge on the tray to the tray seal at the center when rotated.

The central shaft, skimming arm shall consist of a ductile iron shaft section securely attached to the central shaft with a suspended fair-

lead skimming blade for skimming the tank surface. The skimming blade shall extend from near the center of the tank to the tangent blade at the outer end of the skimming arm where it shall form a trap for floating scum. The tangent blade shall be mounted on an auxiliary shaft equipped at the outer extremity with a roller to elevate and support the tangent blade in its travel over the scum trough. A locked device which elevates the skimming blade above the water surface to permit operation without discharging to the scum trough shall be provided. The scum trough and approach ramp shall be of welded steel and provided with necessary supports for firm anchorage to the tank wall. For the Digester compartment there shall be provided scum breaking and sludge raking mechanism.

DRIVE MECHANISM The vertical pipe shaft and attached arms shall be supported and rotated by a drive mechanism consisting of a large diameter, high-tensile cast iron worm gear, driven by a hardened and ground worm. Hardened steel pinion shafts shall be lubricated into the worm gear housing raceway to serve as bearing surfaces for the shafts. The worm shaft shall be provided with grooved bearings.

A mechanical overhead device shall be provided and so designed that the rotation of the worm shaft will operate two necessary switches: one to operate in the event of overload to sound an alarm and the other to operate the motor when the worm gear is rotated overhead to cut off the current to the motor. Any overload shall be shown on an indicator attached to the overhead device housing.

A totally enclosed motor having windings impregnated with moisture

This is a view of the second (Unit #2) Dorr Type DA Degritting Clarigester unit at Totawa, N. J. It is 30' in diameter by 25' total side water depth.

Sewage to be treated first enters this channel where the grit settles out. This grit is continuously raked to a hopper by vertical rotating members attached to the skimming arm. Degrittied, raw sewage overflows an inner weir into the influent well proper. A bypass slide gate permits discharge of feed directly into the Clarifier compartment when desired.

Clarified sewage flows over the weir at the periphery. Solids settle in the upper compartment and are raked to the center by the mechanism for discharge through a sludge seal into the lower, or Digester compartment. Here, the sludge stirring mechanism promotes rapid digestion and gasification and also breaks up any scum formation. A gas dome is provided for gas takeoff and normally this gas is piped to a waste gas burner.

advantages

- Removes troublesome grit from the raw sewage without the need for costly, separate grit handling facilities.
- Reduction of initial cost and operating cost compared with separate facilities.
- No scum formation in Digester due to intermeshed fixed and rotating members at top of compartment.
- All solids are handled **mechanically**. No squeegeeing of the sides or hosing down of gas vents is required as in the old-fashioned Imhoff tank operation.

• Tank construction is less expensive because of the well recognized economic advantages of circular, flat bottom tanks, compared with other shapes.

• Operation is continuous and uniform — a single tank to operate — one point of feed, one overflow, one sludge discharge, one drive unit, no interconnecting piping, no valves to manipulate.

• Mechanical grit removal based on area considerations.

• Maximum digester capacity utilization by grit elimination.

• Maintenance is kept at a minimum.

• A better over-all appearance, in line with modern trends in the construction of mechanical equipment.

• For a low initial cost, well within the means of the small community with populations up to 10,000, the Degritting Clarigester gives the big plant standards of efficiency that are associated with mechanical treatment.



Closeup showing the "Degritting" chamber and raking mechanism in floor of empty tank. This is Unit #1 of two Dorr Type DA Degritting Clarigester units installed at Totawa, New Jersey.

resisting compound shall be provided. Both motor and gear reduction unit shall be of ample size to operate the mechanism under all conditions and the motor shall operate on phase, cycle, volts A.C.

INFLUENT WELL AND DEGRITTING CHAMBER A steel influent well with similar steel degritting chamber attached thereto shall be furnished, provided with ample supports for mounting on and concentric with the vertical shaft. The degritting chamber shall have a flanged pipe connection for the influent pipe. The influent well shall be provided with a sliding gate to provide for bypass of the degritting chamber. A portion of the upper edge of the influent well shall act as a weir for the overflow from the degritting chamber. The degritting chamber shall have a flanged outlet for connection of grit disposal.

DEGRITTING MECHANISM At the elevation of the central skimming arm there shall be supplied three additional structural members all at right angles and attached to the vertical shaft. These three members and the skimming arm shall support and rotate the degritting blades in the degritting chamber around the influent well.

ACCESSORIES A steel tray seal shall be provided for mounting in the center of the tray. It shall be designed to permit passage of sludge unimpeded but to seal off upward flow of digester gas or sludge.

A welded steel dome shall be provided on exterior and interior of digester tank.

A supernatant overflow control device shall be provided for mounting in the center adjacent to the Clarifier compartment.

A 12" vertical pipe shall be furnished where required for circulating digester supernatant.

SUPPORT BEAMS AND WALKWAY Structural beams spanning the tank with ends bearing on steel shoe plates and supported in the tank walls shall be provided. Beams shall be suitably spaced and of ample strength to carry all operating loads of the mechanism without undue deflection. A walkway of 1.15" thick steel plate with single 1x4" cross member extending from the drive unit to the opposite end shall be furnished.

PAINTING All surfaces to be painted shall be thoroughly dry and free of all rust, grease and dirt. Paintings and steel work shall receive in the shop one coat of red oxide zinc chromate primer followed by one coat of industrial enamel gray-green.

The Clarigester

Introduced in 1929, the Dorr Clarigester with its innovation of mechanical clarification and sludge digestion in a single two-story tank, soon proved to the sanitary engineering field that the mechanically-operated plant is not only far easier to operate and control, but is also much less expensive to build, maintain, and run, than the old type of manually-operated plant that it replaced.

Actually, the Dorr Clarigester performs the same duties as those of the Dorr-Oliver Degritting Clarigester, minus the "Degritting" mechanism and chamber.

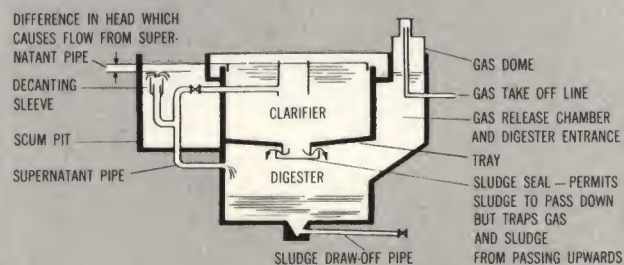


Diagram showing operation of Clarigester.

While concrete tanks are normally used, Dorr-Oliver can furnish for very small flows, a Clarigester in a steel tank, 11' x 6" in diameter x 19' water depth. The mechanism will be completely shop erected and can be shipped to the job site assembled in a steel tank.

The Duo-Clarigester

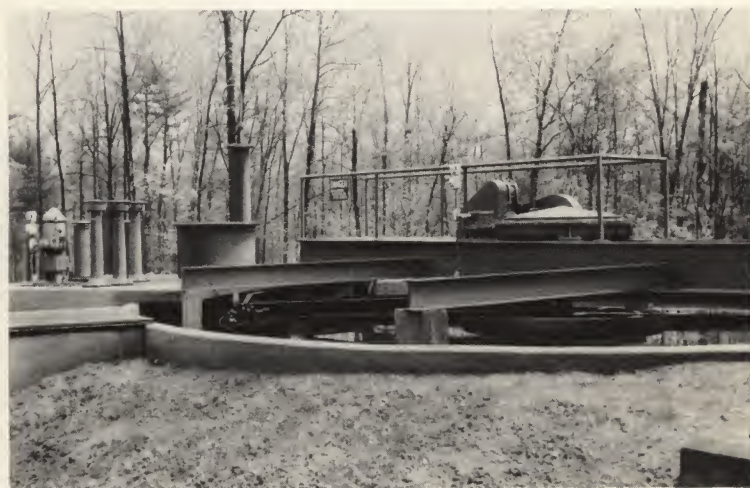
The Duo-Clarigester is a modified Clarigester providing primary and secondary sedimentation as well as sludge digestion in a single tank. This is accomplished by means of a vertical partition that extends from about the liquid level down to the rake arm supports, dividing the upper or clarification section of the tank into two compartments.

The Duo-Clarigester is especially applicable in small, high-rate filter plants for the treatment of domestic sewage or trade wastes and may also be used in connection with activated sludge, standard trickling filter plants, and wherever both primary and secondary clarification are needed.

Normally, raw sewage is introduced first to the primary compartment of the Duo-Clarifier as in conventional flow-sheet practice. Under certain conditions however, such as when heavy grease loads are encountered, it has been found advantageous to feed raw sewage to the digestion section first and then by displacement upward through a pipe into the primary Clarifier compartment. In this way a pre-digestion step is added without additional equipment, and material which would cause difficulties in subsequent steps is removed at the beginning of the flowsheet.

The Duo-Clarigester is available in sizes up to 40' in diameter. Operation is practically automatic. Shock loads are easily handled, and variations in flow do not upset the balance. No sludge pump is needed and maintenance and operating costs are less because of fewer items of equipment.

Although concrete tanks are commonly used, the Duo-Clarigester, noted for its desirability where very small flows have to be contended with, can be furnished in a steel tank 11'6" dia. by 19' water depth. It is supplied, ready for use, with its mechanism shop erected and completely installed and assembled in its two-story steel tank.



This Duo-Clarigester, in operation at a restaurant and service area on the Pennsylvania Turnpike, provides primary and secondary sedimentation, as well as sludge digestion, in a single tank.

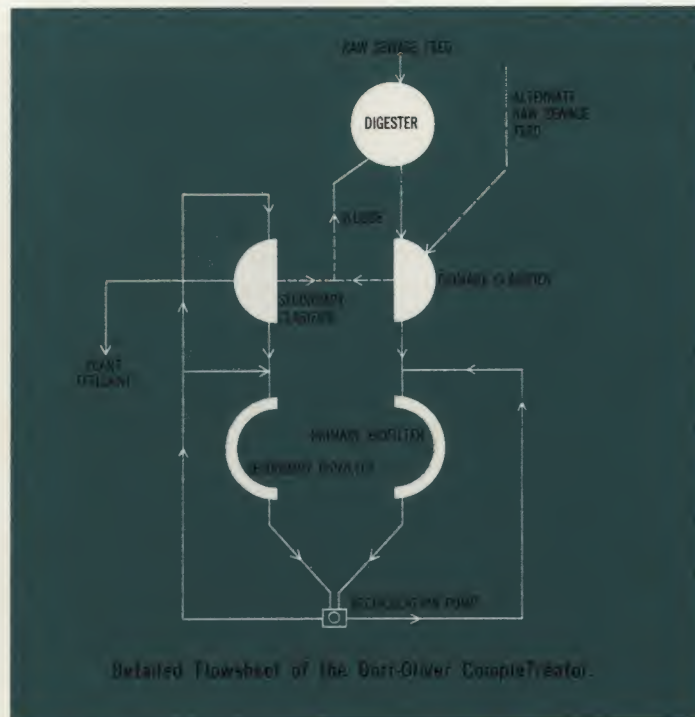
The CompleTreator

The design of small, complete sewage treatment plants to serve schools, restaurants, motels, small housing developments, service stations, etc., has long been a thorn in the side of the consulting engineer and an almost impossible financial burden to the property owner. As a solution to this problem Dorr-Oliver has developed a package-type, self-contained unit called the "CompleTreator" which incorporates in a **single** unit those processes which previously required five separate tanks.

The CompleTreator is a compact, two-stage BioFiltration plant with sludge digestion, designed as a standard unit with a maximum treatment capacity for 150 persons or the population equivalent. It consists of a primary Clarifier, primary and secondary Biofilters, secondary Clarifier, a recirculation wetwell, and a sludge Digester (see Flowsheet). Overall dimensions of the tank are 11'6" dia. x 19'9" high, which is the maximum size steel tank that can economically be shipped intact by rail or truck.

The CompleTreator is delivered at the site wired and completely assembled and ready for installation. Operating at an average design capacity of 15,000 gal./day, it will give results comparable to full size Biofilter plants. The unit is designed for continuous operation and the only attendance the mechanism requires for lubrication and general housekeeping.

This comparatively new innovation in the sanitary engineering field not only results in a decided economy in construction costs but also reduces considerably the land area required for the plant.



The Dorr-Oliver CompleTreator gives the same efficient treatment to relatively small flows, as the Biofiltration process has been successful in accomplishing in hundreds of municipal plants throughout the world.



Two Dorr-Oliver CompleTreator units installed at the Perkin-Elmer Corporation, Norwalk, Conn., provide complete sewage treatment for a population of 1050 employees, using modern, mechanized sanitary engineering methods.

*For further
information on all types
of sewage treatment,
both large and small,
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bulletins available
at your request:*

sewage treatment equipment

- 2508 The DorrClone Classifier for Degritting Sewage
- 6262 The Dorrco Densludge Digestion System
- 6281 The Spiral Heat Exchanger
- 6300 The Dorrco Distributor
- 6301 The Dorrco Vacuator
- 6400 The Dorrco Bar Screen and the Dorrco Sulzer Disintegrator
- 6411 The Dorr Detritor
- 6412 The Dorr-Oliver Degritting Clarifier-Clarigester
- 7313 Small Scale Biofiltration with Dorr Duo Treatment Units
- 7314 The Dorr-Oliver SpiroVortex System
- 7315 The Dorr-Oliver CompleTreator
- 7316 The D-O Aerator

general sanitary equipment

- 6001-R The Dorrco Monorake
- 6192 Dorr Clarifiers

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